

Name: _____ Date: _____

Calculus Review for Q2 Test 1

This review sheet should NOT serve as your only review. Be sure to review your notes and homework as well.

1. An object moves along a line so that its position at time t is given by $s(t) = t^3 - 9t^2 + 24t + 3$ where $t \geq 0$.

- What is the object's position at time $t = 3$?
- What is the object's velocity at time $t = 3$?
- What is the object's acceleration at time $t = 3$?
- Is the object speeding up or slowing down at $t = 3$? Justify your response.
- When is the object at rest?
- When is the object moving right?
- How far does the object travel in the first 4 seconds?

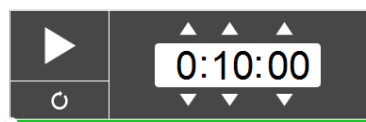
2. An object moves along a line so that its position at time t is given by $s(t) = t^3 - 4t^2 + 4t + 3$ where $t \geq 0$.

- What is the object's position at time $t = 3$?
- What is the object's velocity at time $t = 3$?
- What is the object's acceleration at time $t = 3$?
- Is the object speeding up or slowing down at $t = 3$? Justify your response.
- When is the object at rest?
- When is the object moving left?
- How far does the object travel in the first 4 seconds?

3. Differentiate each of the following with respect to x .

- $y = \frac{\sin^2 x \csc x - x \sin x}{\sin x}$
- $y = \sec(2x)$
- $y = \tan \sqrt{3x - 2}$
- $y = x \cos x$
- $y = \cot^2 x$
- $y = 2x^2 \tan x$
- $y = \frac{\sec x}{\sin(x-1)}$
- $y = -3e^{\cos 3x}$

Do Now



You have 10 min to work
on the review sheet.

$$1) a) S(3) = 3^3 - 9(3)^2 + 24(3) + 3$$

$$= 21$$

$$b) V(t) = 3t^2 - 18t + 24$$

$$V(3) = 3(3)^2 - 18(3) + 24$$

$$= -3$$

$$c) a(t) = 6t - 18$$

$$= 6(3) - 18$$

$$= 0$$

d) neither, moving at a constant speed.

$$e) 3t^2 - 18t + 24 = 0$$

$$3(t^2 - 6t + 8) = 0$$

$$(t-4)(t-2) = 0$$

$$f. \quad \begin{array}{c} t=4 \quad t=2 \\ \oplus \quad - \quad \oplus \\ V(t) \quad \frac{\quad}{2 \quad 4} \end{array}$$

[0,2) V(4)

$$|S(4) - S(2)| + |S(2) - S(0)|$$

$$|19 - 23| + |23 - 3|$$

$$4 + 20 = 24$$

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$$2. a) S(3) = 6$$

$$b) V(3) = 7$$

$$c) a(3) = 10$$

d) Speeding up b/c $V(3) \neq a(3)$
have the same sign
(both > 0)

$$e) t = 2/3, t = 2$$

$$f) (2/3, 2)$$

$$g) \frac{496}{27}$$

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$$4) f(x) = 2x^3 + \frac{5}{x^2} - 3 \quad x=1$$

To find y:

$$\begin{aligned} f(1) &= 2(1) + \frac{5}{1^2} - 3 \\ &= 2 + 5 - 3 \\ &= 4 \end{aligned}$$

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 4 &= -4(x - 1) \end{aligned}$$

$$\begin{aligned} f(x) &= 2x^3 + 5x^{-2} - 3 \\ \text{to find } m \quad f'(x) &= 6x^2 - 10x^{-3} \\ f'(1) &= 6(1)^2 - 10(1)^{-3} \\ &= 6 - \frac{10}{(1)^3} = -4 \end{aligned}$$

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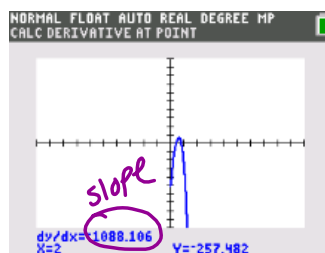
5) Use your calc!

$$x=2$$

y_1 = enter func.

2nd trace → #6

See graph $x=2$



$$y + 257.482 = -1,088.106(x - 2) \quad \uparrow \text{y-value}$$

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4. Write an equation for the line tangent to $f(x) = 2x^3 + \frac{5}{x^2} - 3$ when $x = 1$. (Round all values to the nearest thousandth.)

Calc. 2nd Trace dy/dx enter $X=1$
Func.

5. Write an equation for the line tangent to $f(x) = 3\sqrt{x} - 5e^{x^2} + 7\ln(2x+1)$ when $x = 2$. (Round all values to the nearest thousandth.)

6. Suppose the position equation for a moving object is $s(t) = \sec t + 2t$ where $s(t)$ is measured in meters and t is measured in seconds. Find the velocity of the object when $t = \pi$.

$$3a) \quad y = \frac{\sin^2 x \cos x - x \sin x}{\sin x}$$

$$y = \frac{\sin^2 x \cdot \frac{1}{\sin x} - x \sin x}{\sin x}$$

$$y = \frac{\sin x - x \sin x}{\sin x}$$

$$y = \frac{\sin x (1 - x)}{\sin x}$$

$$y = 1 - x$$

$$y' = -1$$

$$b) y = \sec(2x)$$

$$y' = \sec(2x) \tan(2x) \cdot 2$$

$$y' = 2 \sec(2x) \tan(2x)$$

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$$c) y = \tan \sqrt{3x-2}$$

$$y = \tan(3x-2)^{\frac{1}{2}}$$

$$y' = \sec^2 \sqrt{3x-2} \cdot \frac{1}{2} (3x-2)^{-\frac{1}{2}} \cdot 3$$

$$y' = \frac{3 \sec^2 \sqrt{3x-2}}{2 \sqrt{3x-2}}$$

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$$d) \quad y = x \cos x$$

$$y' = x(-\sin x) + \cos x$$

$$y' = -x \sin x + \cos x$$

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$$e) \quad y = \cot^2 x$$

$$y = (\cot x)^2$$

$$y' = 2 \cot x (-\csc^2 x)$$

$$y' = -2 \cot x \csc^2 x$$

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$$f) y = 2x^2 \tan x$$

$$y' = 2x^2 \sec^2 x + \tan x (4x)$$

$$y' = 2x^2 \sec^2 x + 4x \tan x$$

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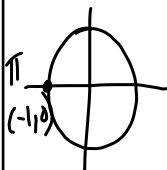
$$g) y = \frac{\sec x}{\sin(x-1)}$$

$$y' = \frac{\sin(x-1) \sec x \tan x - \sec x \cos(x-1)(1)}{\sin^2(x-1)}$$

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$$\begin{aligned}
 h) \quad y &= -3e^{\cos 3x} \\
 y' &= -3e^{\cos 3x} \cdot (-\sin 3x)(3) \\
 y' &= 9e^{\cos 3x} \sin 3x \\
 y' &= 9 \sin 3x e^{\cos 3x} \quad \leftarrow \text{either}
 \end{aligned}$$

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$$\begin{aligned}
 6) \quad S(t) &= \sec t + 2t \\
 V(\pi) & \\
 V(t) &= \sec t \tan t + 2 \\
 V(\pi) &= \sec \pi \tan \pi + 2 \\
 &= \frac{1}{\cos \pi} \cdot \frac{\sin \pi}{\cos \pi} + 2 \\
 &= \frac{1}{-1} \cdot \frac{0}{-1} + 2 \\
 &= 0 + 2 \\
 &= 2
 \end{aligned}$$


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